

# (12) UK Patent Application (19) GB (11) 2 151 142 A

(43) Application published 17 Jul 1985

(21) Application No 8428399

(22) Date of filing 9 Nov 1984

(30) Priority data

(31) 3344934 (32) 13 Dec 1982 (33) DE

(51) INT CL<sup>4</sup>  
A61B 17/00 17/28

(52) Domestic classification  
A5R EW

(56) Documents cited  
None

(58) Field of search  
A5R

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(54) Endoscope and auxiliary instrument with a deflectable leading end

(57) An endoscope has a passage (8) through which passes a shaft (4) of an auxiliary instrument such as a probe, forceps or bundle of glass fibres. The auxiliary instrument has an angularly movable leading end portion (2) connected to the shaft (4) by a flexible intermediate portion (3). The angular position of the leading end portion (2) can be adjusted by axial movement of the shaft (4), causing the end portion (2) to abut against stops which are advantageously formed by leading end portions of the endoscope passage (8). The end portion (2) is preferably biased into an angular position transverse to the shaft (4), so that pulling on the shaft tends to straighten the leading end (2). The auxiliary instrument is preferably rotatable about the longitudinal axis of the shaft (4), so that the leading end (2) can be moved into any desired position.

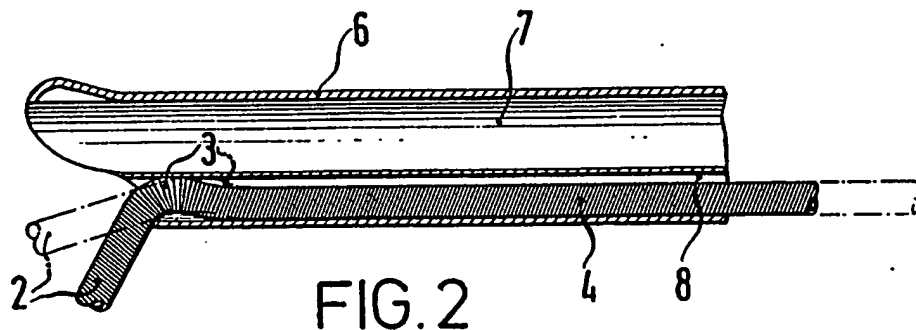
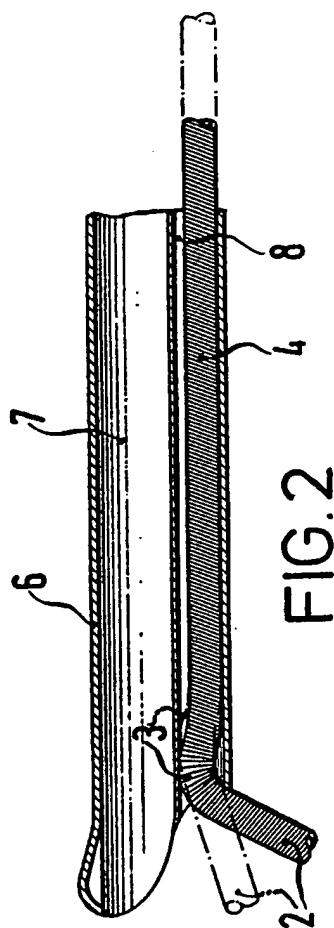
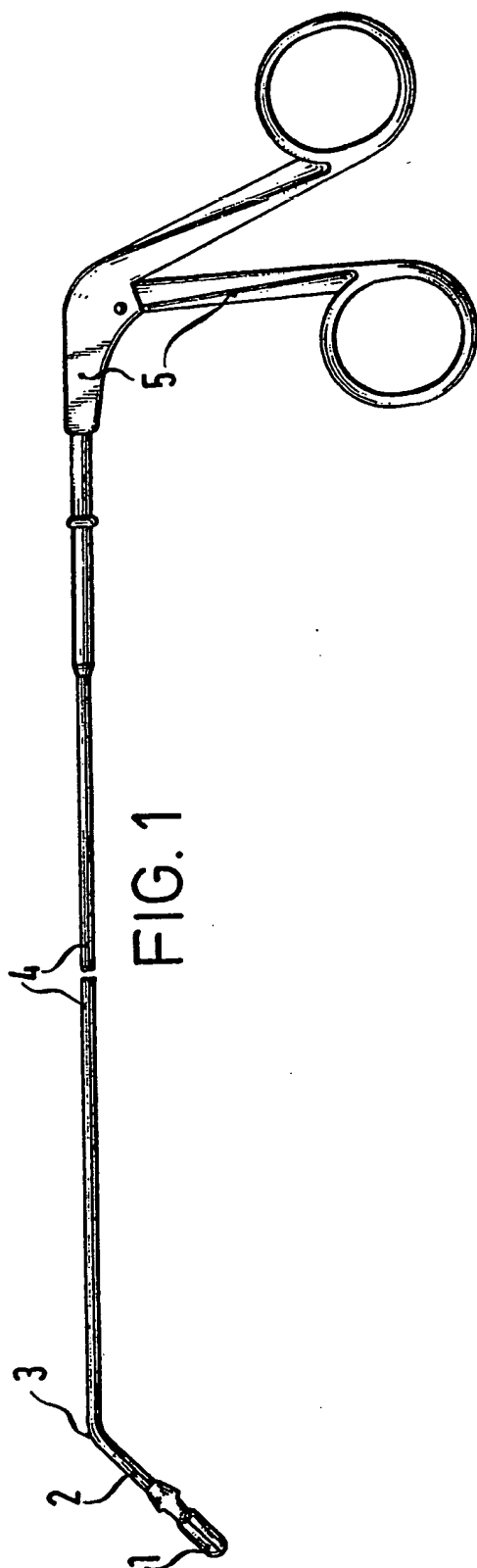


FIG. 2

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## SPECIFICATION

## Endoscope with auxiliary instrument

The invention relates to an endoscope comprising a distally deflectable auxiliary instrument extending through a passage, such as a bundle of glass fibres, forceps, a probe, an injection cannula, or the like.

It is known that a shaft or shaft passage of an endoscope may be traversed by an auxiliary instrument which may be deflected distally (i.e. at its leading end) by means of proximal (i.e. at the opposite end) handles via tension wires or the like acting on a control unit. The distal control unit and the tension wires and their guiding tubes which must be led through the shaft passage, cause the diameter of the endoscope shaft to be substantially increased in part, which under particular circumstances causes considerable discomfort to a patient, in particular upon being passed through narrow bodily passages. In the case of the aforesaid kind corresponding to the prior art, the leading end of the auxiliary instrument cannot be displaced up to points of action situated laterally beside the pivoting plane without the endoscope inserted into the bodily cavity having to be turned about its longitudinal axis, thereby again leading to a working position which may be very uncomfortable for an operator under particular circumstances.

The present invention consists in an endoscope having an optical system and a longitudinal passage through which passes a shaft of an auxiliary instrument, wherein said instrument shaft has an angled distal end portion projecting from the passage and includes at least a resiliently flexible angled portion which can be urged into sliding abutting relationship with the distal end of said passage in such a way that the angular position of the distal end portion of the shaft can be adjusted by axial movement of said shaft in the endoscope passage.

By means of the invention it is possible to keep the diameter of the endoscope shaft to a minimum whilst nevertheless being able to control the leading ends of auxiliary instruments in an uncomplicated manner so that any points of action lying within the field of view may be reached without the position of the endoscope itself having to be altered.

The angled portion of the instrument preferably abuts a leading edge of the endoscope passage and the oppositely situated inner side of the passage into which the angled portion of the auxiliary instrument may be retracted wholly or partly. Furthermore, the auxiliary instrument is preferably rotatable about its longitudinal axis within the instrument passage, so that any point of action within the field of view of the optical system (which is advantageously also arranged to be rotatable and longitudinally displaceable) may be reached with the angularly movable end of the instrument.

The leading end of the auxiliary instrument is preferably biased into an angular position transverse to the shaft, so that when it is passed through a diametrically matching instrument passage other passage, it is held in a substantially straight configuration but upon issuing from the

leading end of the instrument passage turns automatically towards its radially extending free position, as a function of its displacement towards the distal end.

So that the leading end of the instrument may then be manoeuvred to the desired site in the bodily cavity, it is merely necessary to move the shaft of the auxiliary instrument axially and/or to turn it about its longitudinal axis, so that the movable end portion is moved angularly and/or in rotation to locate the desired site. In this way, it is possible to establish practically any angular position.

The displacement of the auxiliary instrument may be performed by hand or by an endoscope drive acting at the rearward end of the auxiliary instrument and may thereby be performed very evenly throughout the range of displacement.

A preferred embodiment of the invention is described in the following with reference to the accompanying drawings in which:

Figure 1 shows a sideview of an auxiliary instrument in the form of forceps,

Figure 2 shows an enlarged axial cross-section through the distal part of a urethro-roscope with the distal structure of the auxiliary instrument.

In accordance with the example of the invention shown, the auxiliary instrument comprises a pair of forceps, but may also be a bundle of glass fibres, a probe, an injection cannula or the like.

The forceps illustrated comprise forceps jaws 1 on an end portion 2, which is joined to the elongated section 4 via an angled portion 3. The forceps jaws 1 are actuated in a known manner by means of the handle 5.

In accordance with the invention, at least the angled portion 3 is flexibly made but all the parts 2, 3 and 4 may be made flexible, e.g. by being formed from a coil of closely wound spring steel wire as shown in the drawings. It is also possible however to make the parts 2 and 4 rigid and to make only the angled portion 3 flexible.

By means of this solution, it is possible to reduce the angular setting of the end portion 2 with the forceps jaws 1 down to a position coaxial with the elongated portion 4, but with the end portion 2 however always automatically returning elastically when released to the predetermined angular position shown in Figure 1.

Thanks to this structure, it is possible to pass the forceps, stretched to a straight configuration throughout its length, through a passage 8 of an endoscope shaft 6, which as shown in Figure 2 has a second passage 7 for traversal by a rotatable and longitudinally displaceable optical system.

As soon as the end portion 2 emerges from the distal extremity of the passage 8, it pivots automatically under spring bias towards the angular position according to Figures 1 and 2.

When the auxiliary instrument is displaced axially in the distal direction, the flexible end portion 2 is moved out of the passage 8 to a greater or lesser extent, and the branch 2 thus occupies increasing angular settings until it reaches its original initial position, i.e. it is possible for the forceps jaws 1 to be carried to any optical point within the body cavity by

pivotal and rotary displacement of the end portion.

- In accordance with the invention, corresponding flexible auxiliary instruments may be led through an instrument passage of an endoscope shaft and to deflect the same omnilaterally at the leading end of the instrument as described in the foregoing with reference to Figures 1 and 2.

#### CLAIMS

1. An endoscope having an optical system and a longitudinal passage through which passes a shaft of an auxiliary instrument, wherein said instrument shaft has an angled distal end portion projecting from the passage and includes at least a resiliently flexible angled portion which can be urged into sliding abutting relationship with the distal end of said passage in such a way that the angular position of the distal end portion of the shaft can be adjusted by axial movement of said shaft in the endoscope passage.
2. An endoscope according to claim 1, wherein the distal end portion of the auxiliary instrument is spring biased towards an angular position transverse to the shaft.
3. An endoscope according to claim 2, wherein the said flexible angled portion of the auxiliary

- instrument is arranged to abut a leading edge of the endoscope passage on one side thereof and an inside wall of said passage on the opposite side, whereby drawing the shaft axially through the passage in a proximal direction causes the distal end portion to move from a radially extending position to an axially-extending position.

4. An endoscope according to any preceding claim wherein the shaft and the distal end portion of the auxiliary instrument are flexible.

5. An endoscope according to any preceding claim, wherein the auxiliary instrument is rotatable about its shaft axis.

6. An endoscope substantially as herein described with reference to, and as illustrated in, the accompanying drawings.

7. An auxiliary instrument for an endoscope comprising an elongate shaft to enable the instrument to pass through an endoscope passage and a leading end portion attached to one end of the shaft, said end portion being biased to an angular position transverse to the axis of the shaft and being attached to the shaft by a flexible connection portion to enable the angular position of the end portion to be adjusted by cooperation with parts of the endoscope.